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IMPORTANT ANNOUNCEMENT:

At no extra cost to present subscribers we are increasing the number of issues published annually from four to five, beginning with the January 1961 issue. This necessitates the publication of the remaining 1960 issues in September and November.

The Management Audit

Victor Lazzaro

▶ Hardly a day goes by but what we encounter expressions such as "Scientific Management," "Management of the 1980's," and "Computers make new demands on Management." Post-war industrial expansion and new scientific developments have focused attention on management's current needs to meet modern business requirements.

Since the last war, we have heard a great deal about management development but relatively little about management appraisal and evaluation. Progress has been somewhat slow in developing methods for measuring the overall performance of management. One technique which is becoming widely accepted for such evaluation is the so-called Management Audit. This article discusses the development and use of a Management Audit.

Bill Leonard defines Management Audit as "a comprehensive and constructive examination of an organizational structure of a company or its components, such as division, or department, its plans and policies, its financial controls, its methods of operation, and its use of human and physicial facilities."[1] He further adds that the primary objective of the Management Audit is to reveal defects or irregularities in any of the elements examined.

Relationship with Internal Auditor and Systems Man

Some efforts have been made by internal auditors to use the Management Audit. However, an internal auditor is concerned basically with the control of money or the safeguarding of property through good accounting procedures. He usually checks procedures for inventory, accounts receivable, accounts payable, purchasing controls, etc. As a by-product of his primary purpose, an internal auditor *may* comment in his report about qualities of supervision and compliance with regulations. To emphasize further the limited interest of an internal auditor in this area, a recent description of a university course in internal audit mentioned that "a new area for discussion in the course is the Management Audit."

Systems people, too, have overlooked the Management Audit area and its potentialities. During the early years of systems and procedures development, hardly a meeting went by without someone asking, "How can we get top management to recognize systems work?" Here in the Management Audit is a golden opportunity for systems men to be seen and heard by top management, and it is being ignored.

Over the years systems men have concentrated mainly on the fundamental tools of management—that is, developing proper procedures, cutting costs, designing forms, and now emphasizing data integration and computers. The report on *Administrative Systems Analysis,* by Dr. Irene Place of the University of Michigan[2], indicates that out of 49 companies surveyed on systems practices, only 5 included "Management Analysis" (note: not Management Audit) as a function of the systems group. You will also find that neither Management Analysis nor Management Audit is included in the Systems and Procedures Association's[3] definition of the range of systems work.

1. *Systems and Procedures,* Prentice-Hall, 1959, p. 96.

2. Ann Arbor: *Bureau of Business Research.*

3. Systems and Procedures Association, *National Board, Policies and Procedures* release September 15, 1956.

Victor Lazzaro, editor of SYSTEMS AND PROCEDURES *(a handbook; Prentice Hall) and former editor of this magazine is a member of the Systems & Procedures Association (New York Chapter) and a former National Director. At one time, he was also chairman of the National Publications Committee. Mr. Lazzaro has a degree in engineering from New York University. Since 1946, he has been associated with Merrill Lynch, Pierce, Fenner, and Smith where he is now manager of the Methods and Procedures Department.*

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Since the Management Audit has not been fully accepted as a function of a professional group, responsibility for it may appear anywhere in the organization structure of a company. For example, some organizations think that the Personnel Department should be responsible for the general appraisal of a department since it essentially involves people; some think that because this is an "audit" of internal operations, the Auditing Department or Controller should undertake such appraisals. Special staff assistants to corporate officers also make studies of this type.

Those organizations which do not have a special department for Management Audits will find that the Methods and Procedures Department can best accomplish the function, for this group already has trained and experienced analysts for making critical studies. It is, therefore, better qualified to make objective analyses than any other organizational component. Furthermore, if the area being analyzed is in need of subsequent special studies for improvement, the analysts are in the best position to respond to the need.

Objectives of Supervision

From an operating viewpoint, department managers and the supervisors are interested in essentially one factor and that is to produce. In their zeal to get production, however, they sometimes lose sight of various important factors such as employee morale, housekeeping, training, adherence to policies, and compliance with standard procedures. Furthermore, supervisors sometimes find themselves in "no-man's land" as the following definition indicates: "A supervisor is a human shock absorber buffeted by both management and his employees."

To clarify a manager's position, Merrill Lynch, Pierce, Fenner & Smith has defined the standard objectives of department managers as follows:

1. To manage the department and its personnel to accomplish the specific objectives and functions assigned to it.
2. To administer within the department, the policies, procedures, and directives established by the division director and the company.
3. To comply with the government's, exchanges', and other regulatory authorities' regulations, practices, and directives applying to those phases of the company's business delegated to the department.
4. To utilize fully in the most economical and proficient manner, the company's supplies, furniture, equipment, and premises.
5. To protect the company's reputation and good will at all times.

The Management Audit is about the best means of evaluating a manager's effectiveness toward the accomplishment of these objectives.

Establishing the Audit Program

A Management Audit program should not be undertaken without the full approval and support of top management. This can be expressed in the form of a policy release from a corporate officer to the applicable organizational groups. The release should cover the purpose of the program, the benefits to be derived, the group responsible for making the audits, the breadth of the program as to the areas to be audited, and if possible, a contemplated schedule of audits.

The schedule for an audit depends not only on the size of an organization but also on the staff performing it. Field offices should be examined about once a year, while a fair-sized department, say of several hundred employees, may be examined about every two or three years. "Trouble" areas or special situations require examination as the need arises.

Merrill Lynch uses the Management Audit technique in its 126 sales offices. The function is a responsibility of the Operations Liaison Department which acts as a link between home office departments and the sales offices. This Department's authority to make office audits is embodied in the description of its functions in the Operations Manual.

Once an audit program has been established and properly accepted, managers generally look forward to the periodic audits.

They realize that a capable auditor can help them recognize shortcomings in the department or office. It is important to understand that a Management Audit is not intended to criticize or find fault with a supervisor. Its purpose is to help him run a better "shop," to improve his supervision, and ultimately to increase productivity through satisfied employees who are performing their work under proper working conditions and in accordance with standard procedures, policies, and regulations.

Areas of Audit

A Management Audit may cover an entire company, a department, or a small operating unit. It is generally used for examining field offices, departments, or smaller segments of an organization.

Company-wide audits are usually limited to specific areas such as an organizational study, an employee opinion survey, or a long-range planning program.

In a departmental Management Audit, such factors as the following are usually examined:

1. Compliance with standard procedures
2. Compliance with company policies and governmental regulations
3. Evaluation of personnel and employee morale, complaints, etc.
4. Housekeeping
5. Organizational set-up
6. Employee training programs
7. Effectiveness of work flow; work schedules
8. General appraisal of operations
9. Actual productivity in comparison to standard and quality of work
10. Extraneous costs such as part-time employees and over-time

Each of these areas may be further defined as required. For example, "compliance with standard procedures" may require a check-up on 10 to 20 basic procedures. To audit "evaluation of personnel" may necessitate that the auditor ascertain the capacity, ability, appearance, and cooperation of all employees and the extent of their training. While reviewing these areas, the auditor is studying each *from the viewpoint of good supervision and management.* A study from an improvement viewpoint only is more within the realm of a methods analyst.

Qualifications of an Auditor

The ability of the auditor is most important for a successful program and a comprehensive audit. It is not easy for a person to invade a supervisor's territory and start asking questions which directly or indirectly reflect on the ability of the supervisor. Furthermore, the supervisor looks at any "expert" from the "ivory tower" with wariness and apprehension.

The Management Auditor should be:

1. Well versed in the general operations of the organization and the area under study.
2. Capable of ascertaining pertinent information in a friendly and unassuming manner.
3. Familiar with the fundamentals of organization and management, and the principles of systems and procedures.
4. Capable of conducting surveys and examinations.
5. Able to prepare a well-written report which includes constructive recommendations.

Probably the most important characteristic of an auditor is the ability to be received favorably and confidently by the supervisors and employees being audited. There is no substitute for reliance and trustworthiness.

Undertaking the Audit

Assuming that the way has been paved to audit a particular department, it is now necessary for the auditor to outline the program as it relates to the area being studied. A basic outline for a general survey should include the following major headings:

1. Organization
2. Policies, Practices, and Regulations

3. Standard Procedures
4. Operations and Cost Control
5. Personnel
6. Layout and Physical Equipment
7. Discussion of Audit with Manager
8. Report

As preparation for studying each phase, necessary questionnaires and work sheets should be drawn up. The questionnaires may be simple where only a "yes" or "no" needs to be checked for an answer, or the lengthy type where a written explanation is required for each question. For the personnel appraisal, a one- or two-page questionnaire is recommended for each employee.

The overall questionnaire Merrill Lynch uses in its Office Audits is about ten pages long and includes practically every possible question relating to office operations. Sample questions are as follows:

1. Is inter-training, using JIT and a training time table, in operation?
2. Are the various record files in good condition?
3. Is the Office complying with the records retention schedule?
4. Are Home Office bulletins brought to the attention of all concerned promptly?
5. Is the Operations Manual being used to advantage?

Any question requiring elaboration is covered further in the report.

As additional preparation for the audit, it may be necessary for the auditor to make discreet inquiries of other supervisors whose work is related to the area to be studied. In other words, the auditor is looking for problem areas which may require special attention. For example, the Personnel Department may state that there is an exceptional number of employee complaints, the Payroll Department may say that time records are inaccurate, or "Legal" may find that there are some regulatory violations, as apparent from customer complaints.

Now what does the auditor actually do in the examination? He must first clear with the supervisor in charge of the area and arrange to have him notify his employees about the auditor's presence and purpose. From this point on, the auditor proceeds pretty much on his own in accordance with the outline previously prepared. Briefly, his routine is somewhat as follows:

1. To discuss with supervisor functions of area, organizational pattern, work performance, budget performance, etc.
2. To examine layout, physical facilities, and overall appearance of Office—cabinets and contents, desks, working areas, etc.
3. To check various procedures to see if they are being followed.
4. To interview each employee on work performance, complaints, and problems.
5. To examine various records for compliance with company policies and regulations.
6. To examine production reports, quality of work, cost reports, etc., for evaluation as required.

In each phase mentioned, the auditor may use a questionnaire as a guide. In addition, he will be recording numerous notes of his observations. For those items which cannot be answered with a "yes" or "no," he must establish a "norm" in his own mind and use good judgment accordingly. This is particularly so when evaluating employee morale or an employee's complaints about the supervisor or other employees.

The question as to whether the auditor may take corrective action depends on the circumstances. A cardinal rule to follow is that he should not make changes or give employees instructions unless authorized to do so by management, the supervisor, or as may be outlined in the description of his latitude of operation. It is best to have the supervisor in charge of the area make improvements or corrections as warranted.

The Report

As in any analysis, the findings of a Management Audit are incorporated in a final report. Again quoting from Bill Leonard

on the Management Audit, "The written report must include the purpose and the scope of the auditor's examination, any limitations made or encountered, and the auditor's findings, opinions, conclusions, and recommendations."

There are various schools of thought as to whether an auditor should discuss his general findings with a supervisor before preparing the final report. Since the primary objective of the Management Audit is *to help a manager run his own "shop" in a more effective manner,* it is only proper to review with him the general findings on which he can take corrective action. Those areas which are beyond the supervisor's scope of authority should also be discussed with him for recommended action. Agreements reached in the discussion with the supervisor should be incorporated in the final report. However, in the report, the auditor is still free to comment on situations and conditions as he personally sees them. Furthermore, confidential information intended solely for top management should also be incorporated in it. It is suggested that the recommendations presented in the report be summarized as an abstract at the beginning of the report.

If a previous audit exists of the area studied, the examiner should compare it with his report.

The various questionnaires, charts, and conditions observed should be presented in the report by subject and, where possible, in the order of importance. Voluminous supporting data are usually presented after the main portion of the report as *Exhibits* or *Schedules.*

Benefits to Be Derived

A recent article in IBM's *Think*[4] magazine stated, "As an individual, no manager can personally do very much at all. His effectiveness is measured in terms of his ability to influence other people to get the job done." Through a Management Audit, we are able to appraise a manager's performance in getting other people to do their jobs properly, economically, and in accordance with policies and regulations.

For a manager, a favorable report may be a good reason for his receiving a financial reward or a promotion. A poor report tells him to do something to overcome his deficiencies.

To a company, good reports are assurance that the organization is operating properly and, in the final analysis, that it is getting a better quality of work at lower costs and with higher profits. Conversely, poor reports mean that corrective action must be taken, either in the form of further supervisory training or special systems studies. Top management is able to take necessary action before it is too late.

With regard to employees, Management Audits render an opportunity to sound them out, check their morale and, in general, create working conditions which will make them happier in their jobs.

Results which can be achieved through Management Audits are:

1. Better liaison between departments
2. Better customer services
3. Better procedures
4. Better understanding of the basic objectives and responsibilities of the area under study
5. Clearer definitions of duties and responsibilities of supervisors and employees

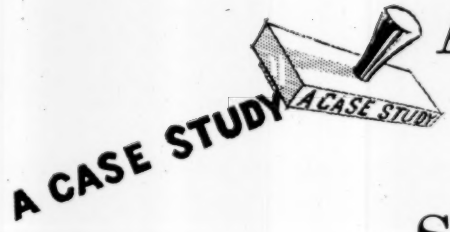
The conclusion of a *Harvard Business Review* (November - December 1958) article on "Management in the 1980's"[5] stated:

"With the emergence of information technology, radical changes in certain administrating practices may be expected." Among the changes the article foresees is that "Appraisal of the new middle managers will become much more precise than present rating techniques make possible . . ."

It is not likely that we can achieve complete Scientific Management or develop a management capable of coping with the new demands of the Computer Age without the use and application of the Management Audit. **s/p/a**

4. Ben D. Mills, *Ford Motor Company,* October, 1958. p. 9

5. Harold J. Leavett and Thomas L. Whisler. pp. 47-48.



Assignment Control for a Systems Department

J. A. Pomeroy

▶ Effective control over the work of professional and administrative employees calls for simplicity in the controls themselves plus an accent on skillful human relations.

The very term "work control" in the minds of professional and administrative employees conjures up ideas of "thought control" or other forms of coercion, repugnant to this type of employee.

System problems and procedural studies cannot be compared with piece work type production studies. The former involve management-level considerations—often intangibles; the latter, measurable routines. Piece work can be scheduled, interrupted, spaced, and speeded with little effect on quality. Piece work is predictable—in a given amount of time a specific number of pieces of work can be expected. Not so with systems assignments, which deal in ideas rather than things. Here, intellectual freedom is an important factor in competent performance, for each problem differs in handling and complexity from all others; each must have individual attention. Changing priorities call for masterful adaptability. A systems analyst succeeds, therefore, as a result of the choices he makes from a complex variety of possibilities in an ever-changing background of facts and forces. Modern management wisely seeks creative personnel for system and procedural studies although this creativity is conditioned and channeled to some extent by the nature of the problems encountered in a systems department. Certain explicit controls are necessary for supervisory guidance and evaluation.

Assignment Controls

Systems supervisors recognize the need for controls and are diligently devising better assignment controls. A real danger to effective systems work, however, lurks in the over-design of controls. Controls which make excessive demands stifle professional and administrative employees and cause justified resentment. The Systems and Procedures Section of the Administrative Services Department at Convair Pomona, Convair Division of General Dynamics Corporation, recently faced this problem. Several assignment control systems had been tried and failed, some because they required excessive clerical maintenance by the supervisor who wrote up the assignment and the clerk who attempted to maintain its current status; others because the control system was cut to a minimum and failed to communicate its status to the supervisor or the need to the analyst. After considerable trial and error, the following "standards" were drawn up to guarantee control over Convair Pomona's management level investigations (and over those who conduct them):

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1. The assignment—what management wants — must be communicated to the analyst in as clear and explicit a manner as possible. This applies to the initial assignment as well as to subsequent changes.

2. "Score keeping"—the status of an assignment—must be kept up-to-date by the analyst.

3. The supervisor must be kept informed through a system which permits his easy follow-up and timely intervention.

4. Records must be simple, calling for a minimum of clerical attention from supervisor, clerk, and analyst alike.

5. A control system must be subservient to departmental objectives so that the completion of assignments is not hampered by the artificial demands of a control system.

The Systems and Procedures Section of the Administrative Services Department at Convair Pomona has devised a successful system of assignment control which meets these basic requirements. Its success is due largely to the fact that the system becomes the analyst's own assignment control system in which a supervisor plays only his essential role. Here is how it works.

A Control Procedure

The Systems Section supervisor makes assignments to analysts according to his knowledge of their special talents.

The basic means of communicating an assignment to the analyst who will perform the work is all-important, since his understanding of the objectives, problems, and limitations may determine its successful completion.

The most successful communication has been achieved at Convair Pomona through oral "briefings" between the systems section supervisor and the analyst, followed by discussion with the managements concerned. These discussions help to create a common understanding of the background, objectives, and tentative plans and schedules of the assignment *before* it is started. Only after such initial discussions is the actual assignment record written out by the analyst who will perform the work. This is Step No. 1. The analyst checks the assignment record out with his supervisor as an assurance that the task has been clearly communicated. Doubtful points are clarified at this time.

The Assignment Record

The Assignment Record is made in triplicate. (See Exhibit No. 1) The original is kept in the analyst's work folder for easy

CONVAIR–Pomona FORM 14-1

SYSTEMS & PROCEDURES ASSIGNMENT RECORD

source of assignment	date received	date assigned	date completed
A. M. Crutchfield	6-4-59	6-5-59	

description of task	follow-up dates
Study operation of the Change Control Board. Flow chart system from preliminary release of design through final release. Determine aberage flow time through system over past 6 months.	6-15-59
Prepare Management Study Report summarizing present system and proposing improvements.	

COMMENTS: Final report due 7-17-59

ANALYST	ASSGMT NO.	TITLE	priority	est. hrs.
JMF	MS-161	CHANGE CONTROL BOARD	A	60

EXHIBIT 1 Assignment Record used in Administrative Services, Convair-Pomona.

reference. Copy No. 2 is filed in a visible card file at the supervisor's desk so that each time new work is received, the supervisor can check the number of assignments each analyst already has. Copy No. 2 remains in this "In-Work" file until removed by the analyst when the job is finished. Copy No. 3 is used for follow-up by the supervisor, who notes on it the next date on which he wishes to check progress. When this follow-up date comes due, his stenographer pulls the copy and reminds him of it.

Once a week each analyst prepares in duplicate a brief summary for each assignment. The supervisor consolidates these status reports into a Weekly Group Report for management. The analyst retains a copy in his work folder.

The Work Folder

An important element of the control system is a work folder maintained by each analyst. Since completed folders represent the results of an analyst's application, they are especially meaningful during periodic performance reviews.

Knowing that recognition during performance reviews will be based solely on achievements demonstrated by completed assignments, each analyst is spurred to make the best use of, and to respect, the simple control tools described above.

A Sample Case

Let us assume that the Administrative Services Department has just been given the assignment to study the adequacy of a system for controlling engineering changes. What can be done to streamline the processing of changes through the Change Control Board? Exactly how long are changes taking to clear to production? The answers to these and related questions are needed by management as soon as possible.

When the Management Services Supervisor receives the assignment, he reviews his assignment record carefully to determine the workload each analyst has. Since this new assignment is needed "as soon as possible," he must decide what other work can best be backlogged and which analyst is most capable of winding up his current assignments in order to concentrate on this new one.

Having chosen the analyst, the supervisor calls him to his desk and carefully reviews the assignment with him: what is wanted; where the assignment generated and why; likely problem areas to probe—a flow chart of the complete present system will be needed; and the average time it has taken for design changes to flow through the Change Control Board during the past six months. The final report is due in two weeks.

Up to this point, no written record of the assignment has been made. If the assignment is unusually complicated or controversial, the analyst and supervisor may discuss it further with department heads who may be affected before considering it as being "pinned down." Now the analyst, aided by his notes and with the discussions of the assignment still fresh in his mind, writes up his Assignment Record, reviews it with his supervisor, agrees upon the first follow-up date, and begins his study. During the study, the analyst keeps his records in the open assignment file in priority order so that the supervisor can determine at a glance which assignments each analyst is working on and how he has classified them. By reviewing this record the supervisor can also adjust priorities as the need arises. Before this system was installed at Convair Pomona, it was difficult to keep up with who was working on what.

When a study is delivered and accepted, the assignment is complete. The analyst files a copy of the Assignment Record with a copy of the final report in his completed work folder. At performance review time, the supervisor reviews the assignments and completed documents prepared by each analyst. His decision to recommend or not to recommend a salary increase is based, therefore, on an analysis of the entire review period, not just on the last assignment he remembers.

Convair Pomona has found over an extended period of time that professional and administrative employees value this method of assignment control. The clerical load of keeping the system up-to-date is distributed as broadly as possible, and gives each person only those records to maintain in which he is most interested—his own. The system has been highly satisfactory to both supervision and analyst. **s/p/a**

Writing Readability into Technical Articles

John Seward Fielden

This is Part I of a three-part article to be continued in the next two issues of *Systems & Procedures*. It discusses how to achieve more readable writing in technical articles and was solicited by the editor of *Systems & Procedures* for two reasons: (1) To help readers prepare manuscripts about their experiences in "systems" work as they evolve in business, government, and industry and (2) to stimulate the type of article Price Waterhouse & Co. is trying to support through its annual award to the Systems & Procedures Association member who writes the best article published in *Systems & Procedures* each year. We thank Dr. Fielden for preparing for us the manuscript, "Writing Readability into Technical Articles."—Ed.

Abstract

▶ Readability in technical or professional articles cannot result from the arbitrary application of a magical formula. Rather, it must arise from intelligent planning and organization of the material to be communicated, and from an understanding of the psychological process of reading.

Just like the weather, which goes its capricious way despite incantations, weather bureau announcements, and almanac predictions, lack of readability in technical or professional writings continues despite the efforts of the various readability-formula makers.

The most famous of these predictors of readability in prose is, of course, Rudlof Flesch, whose *The Art of Plain Talk* (New York: Harper & Brothers, 1946) set publishers and writers to evaluating their books in terms of his formula. Gunning with his "Fog Count," Dale and Chall with their

John S. Fielden is Assistant Editor of the HARVARD BUSINESS REVIEW *and Member of the Faculty of the Harvard Graduate School of Business Administration. Following teaching at Boston University and the University of Illinois, he became an Assistant Professor of English at Purdue University. There his field of study included not only literary subjects, but technical and business writing as well. He is a graduate of Wharton School of the University of Pennsylvania, has a degree from Harvard Business School, and a Ph.D. in English Literature from Boston University. He is the author of numerous articles on both literary criticism and business-technical writing.*

formulas, the General Motors Employee Research Section's "Reading Ease Calculator," and numerous others have joined in the assault upon opaque prose.

With variations, of course, these formulas are concerned with elements of prose which lend themselves to "objective" analysis: sentence length, number of syllables, familiar and unfamiliar words, and personal and impersonal words found per so-many words.

Few, I am sure, will object to the obvious fact that, in general, long sentences are more difficult to understand than short sentences. Why is a formula needed here, especially when blind adherence to it may result every so often in two unclear short sentences in place of one clear longer one? So far as the remaining "objective" elements of writing are concerned, most of us will agree that, while formulas may be genuinely helpful in determining the readability of such things as newspaper dispatches, children's books, grade-school texts, and popular magazines, their applicability to technical papers is another question entirely.

"Measuring" Diction

Diction measurement is usually concerned with a consideration of the number of syllables per hundred words taken at random from a piece of writting, and with some observations about the "personal" qualities of locutions. Flesch's formula, for example, develops a "human interest quotient" based upon the number of personal pronouns, personal names, etc., found in the sample. Both of these considerations of diction are, quite obviously, almost completely inapplicable to the area of composition into which technical writing falls.

The total number of syllables found per hundred words in a newspaper story may possibly offer a worthwhile comment upon the story's readability. But technical writers cannot be guided by the fact that "just table salt" (three words, three syllables) is supposedly preferable to "sodium chloride" (two words, five syllables), or that "place where books are listed" (five words, six syllables) is to be preferred to "bibliography" (one word, five syllables). At least they cannot when they are writing papers for publication in more scholarly journals, or when writing research reports for the company that employs them.

In a field where such phrases as "two contiguous viscous incompressible fluids," "integrated information processing devices," and "calibrated orifices" are commonplaces, the count-the-syllable method of approaching readability is out of the question. As far as the use of personal words, names of interest, etc., is concerned, the impersonal nature of most technical writing precludes consideration.

But does this mean that no method of increasing readability of purely scholarly technical papers exists? On the contrary, it means merely that readability will not be attained by the hopeful application of any magic formulas, but rather, as developed in this discussion, *from a thoughtful approach on the part of the writer to every aspect of the technical article.* It will result when the writer understands the psychology of the reader, realizes what the reader needs to know, and is aware of how the reader can be led through the labyrinth of the most difficult paper by exact planning and organization of material.

The suggestions for improving readability in technical articles offered here certainly will *not* imply that readability need go hand-in-hand with simplification, in the sense of lowering the intellectual level of a paper on discounted cash flow so that the man in the street can read it with understanding and interest. There is much room for improvement in technical articles without unwarranted assaults on their intellectual qualities. They are not written for the man in the street, but for somebody in the same technical field as the author.

Introductory Elements

Although a discussion of writing could begin properly with a consideration of diction, sentence, and paragraph structure, let us postpone these basic matters until later and take up our analysis of readability in technical writings in an orderly way, beginning with the introductory elements of an article or report.

By the term *introductory elements,* I refer to far more than that which often constitutes an introduction to a technical paper. "Introductory elements" will apply here, quite arbitrarily, to all those sections of an article or report which are designed to help the reader come to the central content of the article with understanding. The introductory elements will orient the reader as to the material under discussion, as to what *has been* done, as well as to what is *to be* done in the balance of the article.

The following, therefore, become the parts of the introductory sections:

a) The title.

b) The abstract or capsule summary.

c) The statement of the topic of discussion and the purpose of the article.

d) A description or brief history of the problem, situation, or experiment.

e) A survey (where appropriate) of previous experimentation, previous research, or previous publications on the topic.

f) The method of solution, sequence of logic, method of testing, or theories used to derive the information reported.

g) Definition (where needed) of difficult or new terms, or some kind of glossary.

One can see immediately the importance of these sections of a paper from the standpoint of their scholarly importance. But when attention is not paid to these sections from the standpoint of their *effect upon the reader,* a prime opportunity to increase the readability of a technical paper is overlooked.

Not every type of technical article, of course, will contain all of the introductory elements.

Some quite informal articles will not contain these elements as distinct, separate parts. Any article, however, will be better, I suggest, if its author will consider these elements and include those, developed to a greater or lesser extent, which are necessary and helpful to the reader. I need only ask my readers to turn to the first page of several expository articles in such magazines as *Scientific American* or *Harvard Business Review* to see introductory elements in informal articles that *very carefully* orient the reader as to the purpose and topic of discussion.

In the case of the purely technical article, no other division is more important than these introductory sections, so far as the reader is concerned. Partly this is so because these elements come first and readers have only to examine their own experience to realize how many articles they have begun and not finished, so confusing or dull were the opening sections. It is, therefore, necessary for the writer to pay special attention here, and to attempt to orient his reader thoroughly concerning the subject of his paper before progressing into the more detailed text of his work.

The Title

Beginning with the title of his paper, the author should seek exactitude and clarity. He should avoid such nebulous titles as "A Note on Thermodynamics," or "Elastodynamic Problem" in the purely scientific field, and vague titles like "A Feasibility Study," "Systems Work," or "An Accounting Method" in the business-technical field. Effort is well spent in finding a title that is descriptive of the article topic but provocative and interesting to the reader. After all, the purpose is to encourage him to begin the article.

The Abstract

The writer should remember, too, that his abstract helps to secure readers. A person has merely to scan abstracts found in the journals in the technical sciences to discover how routine and boring many are. Hardly likely to attract readers, they seem often a pastiche of sentences culled from the text and incoherently yoked together.

The writer should conjure up the image of the general reader in his mind and then tell this apparition in simple words the nature of the problem or subject to be discussed, any unique methods of solution or analysis used, and finally the results or conclusions reached. As far as length is concerned, most journals allow from 50 to 200

words for the abstract. It is hardly likely that more would ever be needed; for, in short, the abstract does not try to condense the *whole* subject matter into a few words, but rather to present to the reader the *heart* of the subject matter. Since anyone's purpose in writing anything is to communicate his ideas to others, the writer must make the most of the fact that his abstract is aimed at encouraging readers to take up his paper and read it.

If the journal which accepts the article publishes only the briefest of abstracts, its editorial staff will experience no difficulty in pruning the overly-long abstract to size. In fact, most editors find it easier to do this than to write the abstract from scratch themselves. Depending on the size of the journal, it is sometimes possible to vary the format; a list of questions, for example, can serve the same need.

The Purpose

Writers of published technical articles are usually well-drilled in giving an early statement of the purpose of their paper. If they are not, editors usually seek a revision which includes this all-important item. Often, however, the statement of purpose as given reflects more the *writer's purpose in conducting the investigation than it does his purpose in publishing his work*. Both are, of course, necessary.

It is one thing to state that one's purpose is to investigate the speed of an electronic data processing machine; it is another thing entirely to communicate these findings to a reader and to show him why this matter of speed is important to him. The latter will naturally increase reader interest, and what is more important to considerations of readability than the interest of the reader?

History of Problem

Once the "why" of the investigation is brought to the reader's attention, it is an easy transition to a section which thoroughly describes the problem and its history. Involved in its history will be such matters as previous research, experimentation, or analysis which sought to solve the problem. Often this section will be brushed aside by writers on the assumption that these matters will be of interest only to scholars in the field. Thus: "Davidson (1) suggested that . . ." and "Smith (2), Brown (3), Hodgkiss (4) discuss this briefly . . ." are undramatic enough, but "Refs. 3 through 11 . . ." is even less so.

It may be of extreme interest to the reader to have the drama of current research or new practices brought into historical perspective. The general background of how a new management approach was tested or a scientific truth was pursued and found by fellow investigators, made real through the inclusion of some biographical material, may well catch the interest of the reader and contribute to his continuing with the paper.

Here, of course, as elsewhere, the person discussing readability in technical articles runs into two bugaboos:

(a) The shortage of space allowed to "unnecessary" details in technical papers by the publication.

(b) The timidity of scientific and technical writers about entering into lively and readable discussions of matters which can be stated *concisely, if dully.*

It is not my purpose to digress on the justness of these two conditions which exist, but I would like to suggest that technical writing cannot be completely impersonal, undramatic, stylistically stultified, and be truly readable too!

At any rate, the writer of the technical article must orient his reader as to the important research or experimentation that has gone on prior to the present instance. He cannot assume that the reader will be familiar with the literature in the field, or that the reader will assume that the present paper is truly a unique contribution to knowledge. In an important sense, a writer has the obligation to justify his work as original. Proving this to the general reader cannot help increasing the interest of the reader who has learned by bitter experience that much published information is rehashed prior work.

(Continued, September Issue)

Accuracy in Clerical Work

Eugene C. Yehle

▶ "How many transactions should one check to be assured of accuracy in clerical work?" Ask the question of an auditor, and he'll say, "That depends." Ask it of a statistician, and that will be his answer too.

What does it depend upon? From the auditor's point of view it depends upon what turns up in the course of his examination. He looks not only for outright mistakes, but also for authorizing signatures, proper descriptions, adequate supporting memoranda, and otherwise satisfactory conformance to procedures which are supposed to govern the handling of transactions. He watches for the unusual and the unexpected things that mean poor internal control and, possibly, fraud. He continues until satisfied that the records are in acceptable condition. It is not surprising, then, that the auditor feels incapable of predetermining the extent of his own, let alone someone else's, examination.

The statistician, on the other hand, looks at the question from a more detached point of view. It is no different to him from a scientist's inquiry about the number of experiments that should be run. He presumes that mistakes and departures from procedure can be defined, observed, and therefore counted and measured. Give him a few more facts concerning the work load, the dollar values at stake, and the error level that can be tolerated, and he is not at all reluctant to recommend a checking procedure.

The auditor's point of view has been ably presented on many occasions.[1] It needs no further discussion here except to note that insofar as the accountant is able to detach himself from the audit, statistical methods can be of value to him.

Checking Invoices

The case described below concerns invoices covering purchases of bulk mailing and duplicating items. The dollar amounts involved are small and the auditing problem is not a major one, but some checking is desirable prior to authorizing payment. Analysis of the situation began with the collection of information during a 12-day survey period. The resulting data are summarized in Tables I and II.

1. See, for example, W. D. Cranstoun, "A New Look at Basic Auditing Techniques," *The Journal of Accountancy*, October, 1948.
R. W. Johnson, "Statistical Techniques Need Deeper Study Before They Can Be Useful in Auditing," *The Journal of Accountancy*, September, 1953.

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Table I

Size of Invoices Received During a 12-Day Study Period

Invoice Size	Number*	Per cent
Up to $4.99	275	35.1%
5 - 9.99	149	19.0
10 - 19.99	146	18.7
20 - 49.99	147	18.8
50 - 99.99	38	4.9
100 - 199.99	18	2.3
200 - 299.99	4	.5
300 - 399.99	2	.3
400 - 499.99	1	.1
585	1	.1
747	1	.1
1465	1	.1
	783	100.0%

*Invoices examined on 12 days in December, 1958.

Table II

Characteristics of Invoices

All invoices received in a 12-day period	783
Average number per day	65
Average amount	$24.10
10% random sample of invoices	77
Average amount	$23.10
Average number of items per invoice	3.0
Errors discovered	2
1. Multiplication	$2.00 overcharge
2. Multiplication	$2.50 overcharge
Error rate per 100 invoices	2.6

Most invoices are indeed small—over half under $10. On the other hand, large ones appear occasionally, and about 1 per cent are over $200. Work volume is indicated by the number of invoices received per day—about 65. The discovery of two errors indicates an error rate approximating 3 per cent.

The survey turned up an interesting sidelight concerning the representativeness of even rather small samples. In order to cover an extended period and yet limit the amount of checking, a 10 per cent sample had been chosen arbitrarily. Selection was accomplished by taking every tenth invoice. As indicated in Table II, the invoices averaged $24.10 each during the survey period, and the random sample of only 77 invoices gave an estimate of this average which differed from it by only $1.

A Checking Procedure

Four principal elements determine a checking procedure: (1) What to check for, (2) how large a sample to select, (3) the manner of sample selection, and (4) what action to take when deviations are discovered.

The data from the survey period provide the foundation for designing such a procedure. In the first place, the principal purpose for examining invoices was to look for mistakes. This need not be true as a general matter, for there are occasions, such as in settling interairline accounts and in aging receivables, where documents are sampled for quite a different reason. For example, an estimate of the total dollar amount owed might be desirable in order to avoid a complete tabulation of a large volume of paper records. Such a sample must be adequate to give an answer within an acceptably small range of that which would be obtained by a complete tabulation, but the discovery of errors would play a secondary role, or even represent a different problem.

Returning to the case at hand, four major points are checked: prices, quantities, multiplication, and addition. On a typical invoice with three entries there would be three pricing operations, three quantity verifications, three extensions, and one addition. Altogether they comprise ten "error opportunities."

The traditional auditing approach views each invoice in its entirety as being either correct or in error, and, therefore, as being a single error opportunity. This view is just as sound as considering a whole airplane as a unit which must be operable. However, the inspection of invoices and airplanes proceeds step by step, and it is as important to focus attention on the parts as well as on the whole. In fact, the quality of the whole depends upon the quality of the parts.

An Error Opportunity (E.O.) Concept

The error opportunity concept is basic to the determination of the sample size. If each invoice has an average of ten error opportunities, there are an estimated 650 potential errors per day (65 x 10) and 3,250 per five-day week. (See Table II) Some

fraction of these possibilities is to be checked and, assuming all is well, a batch of invoices will be released for payment. Since it is customary, in the present instance, to release on a weekly basis, a batch or lot would have approximately 3,250 error opportunities (325 invoices).

This lot size determines the sample size. For example, in the widely used Military Standard Sampling Tables[2] lot sizes 3,201 to 8,000 call for a sample of 225. The number 225, in the present context, means 225 error opportunities, not invoices. However, the invoice often is a more convenient sampling unit, and under ordinary circumstances one may determine this number by dividing the specified sample size (225) by the average number of error opportunities per invoice (10) to get the number 22, in this case.

The conversion to invoices for a sampling unit takes some liberty with statistical theory, and assumes that mistakes do not tend to be concentrated within just a few invoices. An alternative, which avoids this assumption, is always available, but it carries the penalty of an increased sample size. For example, referring again to the Military Standard Tables, a lot size of 325 invoices per week requires a random sample of 50 invoices—more than twice the number previously specified. Or to put it another way, the first approach requires a 6.8 per cent sample (22/325) of invoices received, the second requires 15.5 per cent (50/325).

Drawing the Sample

The word "random" characterizes the third element of a checking procedure—the actual sample selection. The randomness concept underlies all sampling theory and literally anticipates a blind drawing of work elements. While a strict interpretation of this principle is desirable, practical considerations often lead to some violations. One has already been mentioned—the sampling of invoices, instead of error opportunities. Several others may be necessary to fit checking procedures into the daily work routine.

In the specific case under discussion, it was decided to include all invoices over $200 in the sample. The number of such invoices was so small that they were unlikely to be selected in a random sample. Yet the potentially large dollar value involved, in the event of an error, dictated that they should be examined.

Another compromise permitted checking a few invoices each day, rather than waiting for a week's accumulation. This meant that some daily sample number had to be specified. Four per day were chosen, although this meant 20 per week, rather than 22 as originally determined.

Finally, the plan for accumulating the sample called for selection on a serial, rather than a blind drawing, basis. Beginning with a random start, every 16th invoice was put aside—except as interrupted by invoices over $200 in value—until four were chosen. The interval of 16 came, of course, from splitting the average daily number of 65 into four equal parts.

Acceptable Quality Defined

The last element in the systematic checking process concerns the action which follows the discovery of mistakes. Each invoice selected is examined completely for errors, and as long as none is found throughout the week, the entire week's billings are approved for payment. In fact, as many as two errors per week may occur and still permit approval.

Table III

Single Sampling Plans

Lot Size	Sample Size	Acceptable Quality Levels					
		.15%		.25%		.40%	
		Ac	Re	Ac	Re	Ac	Re
1301 to 3200	150	0	1	1	2	2	3
3201 to 8000	225	1	2	2	3	3	4
8001 to 22000	300	2	3	3	4	4	5

Department of Defense, Op. Cit.

2. Department of Defense, *Sampling Procedures and Tables for Inspection by Attributes*, Mil.—Std.—105A, 11 September, 1950, U.S. Government Printing Office, Washington 25, D.C.

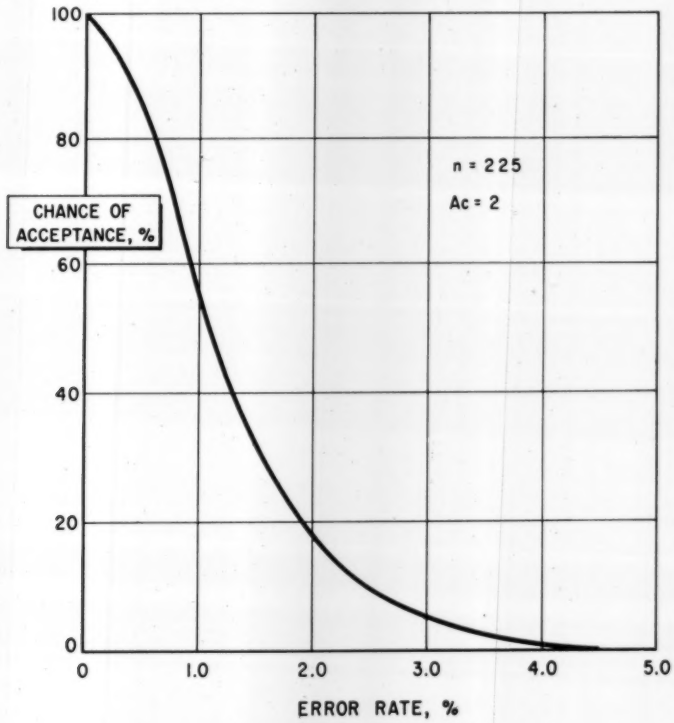
Just as lot size determines sample size, so the desired quality level determines the allowable number of errors. According to the Military Standard Tables, a portion of which is reproduced in Table III, an acceptance number of "2" corresponds to the previously determined sample size of 225 and an Acceptable Quality Level (AQL) of 0.25 per cent. The AQL represents that percentage of mistakes, out of the total number of mistakes that might occur, which can be tolerated over the long run. It does not imply that mistakes are desirable, but it recognizes that most situations do not demand perfection. It emphasizes error control rather than complete error elimination.

The AQL differs from one problem to another, and may at times be 0.0 per cent, in which case control by sampling is not feasible. In the present instance, the error rate during the study period was 2.6 per cent per invoice or 0.26 per cent per error opportunity. This was judged to be reasonably small by the parties involved, and led to the choice of the 0.25 per cent AQL.

The acceptance number "2," and the rejection number "3," mean that the need for emergency action arises only when three or more mistakes are found during the week. The occurrence of that many mistakes implies an error rate beyond that which has been established as acceptable. It may require complete examination of all invoices for that week, more intensive examination from that date forward, filing a complaint with the supplier, or other steps judged to be appropriate under the circumstances. The choices elected here included both notification of the supplier and 100 per cent checking of invoices for the balance of the week. This served to put pressure where it was needed most, and to reduce the week's total proportion of undiscovered errors.

CHART 1

OPERATING CHARACTERISTIC CURVE
FOR SPECIFIED SAMPLING PLAN



SOURCE : DEPT. OF DEFENSE , Op. Cit.

Protection Afforded by Sampling

The protection offered by sampling systems, following such modifications and compromises as have been discussed, can scarcely be stated with precision. However, the operating characteristic curves printed with the Military Standard Tables give a rough approximation. Chart 1 shows such a curve for a sample of 225 and an acceptance number of "2." It indicates that if the error rate is actually as low as 0.25 per cent, or 8 errors in an average week (0.0025 x 3250), chances are 95 in 100 that the invoices will pass inspection and payment will be authorized. If, however, the error rate is as high as 2.5 per cent, or 80 errors per week (0.025 x 3250), chances are only 10 in 100 that this unsatisfactory condition will go undiscovered. Other points of interest can also be read from the curve.

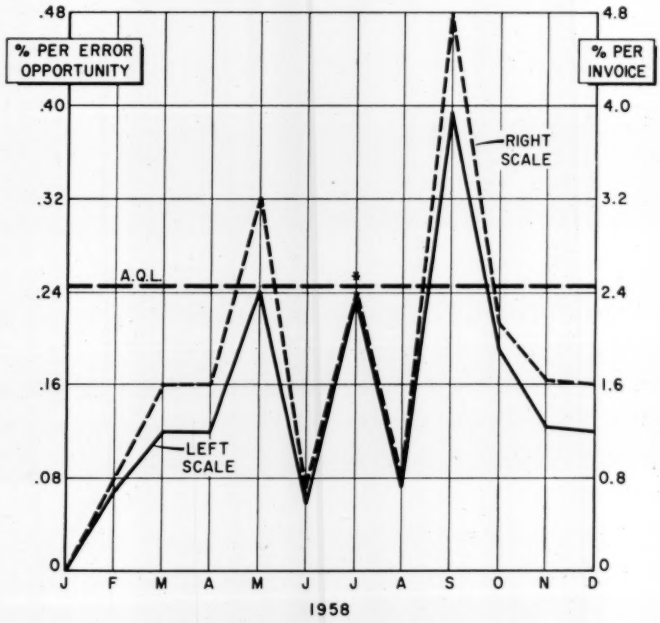
Additional protection, not measured by Chart 1, comes through checking all invoices over $200, the occasional 100 per cent examination periods, and the rule for supplier notification. Furthermore, a record of the auditing results, as illustrated in Chart 2, provides the historical evidence needed for an overall evaluation. It assures that the actual long-term error rate is known and that action, beyond what the sample inspection dictates, can be taken if necessary.

On an error opportunity basis, the invoice accuracy remained below the established Acceptable Quality Level of 0.25 per cent in all months except September. While September shows a higher rate, 0.39 per cent, the invoices nevertheless were approved for payment. This apparent inconsistency is readily explained, however, by Chart 1, which indicates that an error rate of 0.39 per cent has about a 90 per cent chance of going undetected. The important point to note is that the accuracy level usually was better than the AQL, and did not frequently run in the borderline range.

The dashed curve in Chart 2 shows the error rate on an invoice basis. It follows somewhat above the error opportunity curve,

CHART 2

ERROR RATE IN INVOICES SAMPLED



* 100% AUDIT REQUIRED DURING TWO WEEKS IN JULY

Table IV

Size of Errors Discovered

Error	Undercharges	Overcharges
$ 0 - 4.99	72 %	77 %
5.00 - 9.99	10	15
10.00 - 19.99	6	0
20.00 - 39.99	6	0
40.00 - 79.99	6	8
	100%	100 %
Total number	18	13

Note:
Average item value. $35
Average erroneous invoice..29
Average invoice sampled. . .54
Average invoice received. . 18

Table V

Relative Magnitude of Errors

Characteristic	Dollar Value	Average Relative Error
Total net error (undercharge)*	$ 44	
Sum of items on which errors occurred	1,064	4.2%
Sum of invoices in which errors occurred	4,968	0.9
Sum of invoices audited	94,711	0.05

*The total gross errors (ignoring in whose favor) amounted to $205.

because the items per invoice increased during the year, as shown below:

	Invoices per Week	Items per Invoice	E.O. per Invoice
Survey period (Dec. 1958)	325	3.0	10.0
Oct.-Dec. 1959	370	3.9	12.7

Since the number of invoices received also increased, one may suspect that the original sampling procedure is no longer adequate. The reader may verify, however, that the changes have not been large enough to call for a revision.

Size of Errors

One further point, related to the historical auditing record, merits discussion. The procedures recommended here almost completely ignore the dollar magnitude of errors in favor of controlling their frequency. Auditing all invoices over $200 closes this gap only partially, and one cannot help being concerned over the possibility that appreciable errors will go undetected. Table IV shows our experience on those mistakes which were discovered. Undercharges actually occurred more often than overcharges, and exceeded the overcharges in dollar value as well. Thus, in a sense, the auditing did not "pay for itself."

While there are no conventional yardsticks for measuring error size comparable to those used for error frequency, Table V offers some alternatives. The net total of errors discovered, when related to the total value of the *items* on which those errors occurred, amounts to 4 per cent. However, the same figure compared to *incorrect invoices* and to all *audited invoices* is far less, as shown. The total gross error, while almost five times the net error, similarly appears very small.

Summary

The success of the auditing program just described is difficult to evaluate. The sampling and auditing work took approximately twenty minutes of clerical time each day, plus several hours more on two occasions when 100 per cent examination was required by the occurrence of an excessive number of errors. For this expenditure of time, on relatively low-value invoices, no direct savings can be demonstrated.

However, some degree of control appears desirable even on small items, particularly when their combined volume creates sums of considerable magnitude. In the present instance, the weekly total averages $6,500. This figure in reality represents one large invoice, portions of which are audited prior to payment of the whole.

As a result of continuous sampling, the invoice elements are known to be in error less than 2 per cent of the time, and to be practically neutral in their effect on the dollar amount invoiced. Those people who, in similar circumstances, must sign their names to authorize payments, can best judge the value of such information. **s/p/a**

The Challenge of Mechanization

G. H. Cowperthwaite

▶ For many companies today, the challenge of mechanization is one of paramount importance. Rising clerical costs demand at least partial mechanization of the administrative function if management is to be provided with the information required and if costs are to be maintained at a competitive level.

Whether the person responsible for planning the processing of this information is a chief administrator, financial officer, accountant, systems analyst, administrative assistant, or one of his subordinates, he is concerned with:

1. Understanding the possibilities of mechanization.
2. Keeping aware of developments.
3. Evaluating and recommending courses of action to management.
4. Planning for the use of equipment.
5. Installing equipment and achieving the benefits forecast.
6. Maintaining an efficient system of mechanization.

In this paper, the term "mechanization" refers to any form of electronic, electrical, or mechanical processing equipment that is used in the administrative function. Since the introduction of bookkeeping machines and punched card equipment in the early years of the century, there has been a series of developments in mechanization which has led in the past ten years to an increase in the use of all types of equipment by an increasing number of companies. More companies are using equipment as the pressures of competition necessitate that administrative overhead be kept as low as possible. These installations have aimed primarily at reducing the amount of clerical work involved in processing paper work or at providing increased management information.

At present, the status of mechanization in the office has reached the point where new equipment is being announced almost monthly. New ideas are being evolved as to what the equipment can do and how it can best be used. Notable among the wide variety

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of equipment available is the electronic computer, with purchase costs ranging from $50,000 to $2 million, and punched card equipment renting from $150 to several thousand dollars a month. Increased use is also being made of integrated data processing equipment which includes such items as tape producing typewriters, bookkeeping machines, teletype equipment, and calculators. This type of equipment is sometimes referred to as the link between the origination of paperwork and its processing at high speeds on punched card or electronic equipment.

Confronted with such an array, the one responsible for making selections must take care not to become mesmerized by either the range of equipment available or by the claims made by the equipment manufacturers.

One of the problems is to keep informed of developments about mechanization for administrative data processing. Magazine articles, literature releases by equipment companies, shows sponsored by associations, and association meetings can all be valuable. A little learning, however, is a dangerous thing. Before a major decision is reached, serious consideration should be given to consulting "professional" advisors, such as specialist groups, accountants, and professional associations.

The more significant advantages to be gained from partial or complete mechanization include:

1. Decreased operating costs.
2. Greater availability of management information.
3. Greater capacity to process clerical work at lower dollar costs.
4. Greater accuracy and speedier processing.

These advantages can be significant but, at the same time, one must consider the problems that can arise from the use of such equipment. The major ones are as follows:

1. Inadequate appreciation of the degree of planning or the amount of change necessary when mechanizing.
2. Inflexibility which sometimes results from machine systems.
3. The necessity for rigid adherence to standard procedures if schedules are not to be upset.
4. High calibre of personnel required to *manage* machines.

Assuming that the above is understood, these questions might be asked: How can an accountant, a systems analyst, or an administrative assistant prepare for mechanization? How can he be of service to management in this area?

The Preliminary Survey

The first step is the survey or the evaluation of present procedures. This is a vital step that should be taken with the knowledge that a majority of today's mechanized installations fall short of producing the benefits anticipated. Many feel that the high percentage of failures is directly related to inadequate preliminary surveys. In surveying present procedures, it is important to realize that it is the exceptions which present the problems. They are frequently overlooked. When all the facts have been obtained, present systems should be carefully reviewed to determine where work duplication or inefficiency exists. Duplication and inefficiency are inherent in nearly every system, and their correction can often produce benefits far beyond those which might result from the use of more complex equipment. This is frequently the case in companies contemplating the use of electronic equipment.

After the present procedures have been surveyed, the proposed system, assuming that more advanced equipment is to be used, should be worked out in block diagram form, with particular reference to apparent weaknesses. The next step then is to assess costs on a realistic basis. Particular care must be taken to consider hidden costs, so frequently overlooked in the planning stage; for example, the cost of freight on equipment, space renovation, salaries, and the

rental of equipment during run-in periods. Such costs can be substantial and, if not taken into account at the outset, can result in unexpected heavy expenditure. In addition, the possible benefits in terms of costs and other intangibles should be considered. These include staff who become "surplus" under the new system. Here again, a realistic approach is necessary if the day of reckoning is not to be painful to all concerned.

The Report

Following the above steps, a report should be presented to management. The report is essential and should weigh carefully the results of the study with *specific* references to benefits anticipated and the costs which must be incurred. It should also be observed that an effective system of mechanization must in all likelihood be custom-made and not just an adaptation of methods that have been used by other organizations.

The Plans

Once a decision is made to proceed with a system of mechanization, what plans should be made for the use of the equipment? Planning is especially vital in the preparatory period; it may take years for electronic data processing, or months for other types. The importance of planning in either instance must not be underestimated. It is also essential that the responsibility for the planning of a new mechanized installation be assigned to an official in the organization who has adequate time to spend on it. A master plan should be developed which provides for each step to be undertaken before new equipment is installed.

Systems to be used must be worked out in detail. The block diagrams developed during the preliminary survey can be used as the basis for the procedures.

Staff should be carefully selected. A decision has to be made as to whether an experienced staff group should be hired from outside or whether it should be trained internally. Either procedure can be satisfactory. Many companies prefer, however, to use equipment companies' courses to train existing staff. Aptitude tests which have been developed and tried in a wide range of companies can also be used to identify trainable staff members who can be transferred effectively. Procedure development is also an important stage of planning. A periodic review should be made of procedures. Mechanizing the payroll is a favorite starting procedure because of the ease with which it can be converted to the newer machines. Many companies find after review, however, that the machine time used by such applications could have been more profitably spent in production control or factory machine scheduling.

Careful planning for every stage of a new mechanized installation, together with the confidence that comes from good teamwork and thorough preparation throughout, is the goal if satisfactory performance is to be assured.

Trial Runs and Indoctrination

When the equipment is delivered, trial runs must be made to test all phases of the new systems as well as the performance of the equipment. It is difficult to run two systems—the old and the new—at the same time. Careful planning for this trial-run period can reduce the number of inevitable problems involved in the change-over. Indoctrination of management and line personnel is part of the change-over that is sometimes overlooked. All executives, from the president down, should take some interest in the new system, for the greater the knowledge concerning the equipment in the organization the better.

Once the equipment for the new system has been installed, the question arises as to how to deal with the problems and crises that arise during the early days. Management backing and support are particularly important at this point. If management is sufficiently informed about the plans, it will have confidence that problems such as delays in preparation of reports and submission of statements to customers can be overcome. Management must understand that problems are inevitable in any major changeover.

What assistance is available during the changeover period? Many fail to realize the degree of aid that can be expected from the

equipment companies. Provision for this assistance is included in either the rental price or the purchase cost and should be requested at the time negotiations are being carried out. Equipment companies are particularly helpful in developing detailed procedures and training staff. It is unwise, of course, to leave the entire system development to equipment companies, as they sometimes take the line of least resistance and install a system that parallels one they saw operating in another company. The type and extent of the assistance expected from the equipment company should be settled in advance; some estimate should be made of the number of hours of assistance that can be expected. Another valuable source of assistance during the changeover period is the professional advisor. On this staff are men who have substantial installation experience. While to some consulting assistance might seem a luxury, many companies have found that the fees involved are more than recovered in a short period of time because of a smoother changeover period, fewer costly system design errors, lower costs generally, and the earlier achievement of forecast benefits.

It is important to know *where* cost reductions are to come from and to *plan* specifically for their realization. This involves identifying the individuals who will become "surplus" and indicating when their duties will be changed as a result of the new system. The task of achieving cost reductions can be assigned to the line supervisors, but they must be thoroughly instructed in the new system and have confidence in it if they are to accept the responsibility.

Maintenance and Control

Assuming that all stages of an installation have been completed satisfactorily, let us now examine briefly the maintenance and control of the system. It is important to realize that a new system is usually at peak efficiency a few months after it has been installed. Thereafter, changing circumstances, increased volumes, and other factors will affect efficiency. Many organizations feel that a system should be carefully reviewed about every three years if costs are to be kept within reason. Emphasis should be placed on the importance of a periodic review by an impartial observer. Lack of time, experience, and up-to-date knowledge of modern developments often make it difficult to produce an objective review from within an organization.

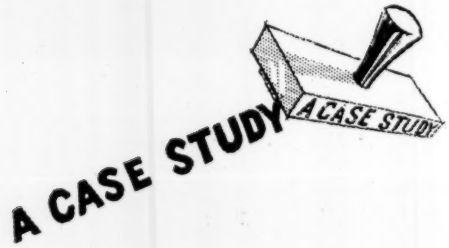
Job evaluation and staff training are other important aspects of maintaining an efficient system. Job evaluations insure that the content of each job necessitated by the system, be clearly defined and thoroughly understood by all concerned. They assist in training staff and prevent the development of small groups which, because of their special technical knowledge, come to be thought of as the "key" people and thus are in a position to hold the company to ransom.

Avoid over-mechanization. Many companies have mechanized too many clerical functions. In marginal cases resist the glamour of "mechanization" and try some of the other methods. On the other hand, if an operation can be performed more efficiently and more economically through mechanization, then, of course, it should be mechanized.

In conclusion, let us look briefly into the future. There is likely to be a greater use of mechanization in the small as well as larger and medium-sized firms. Competition will be responsible to a great extent for this. Many companies will find that their competitors are producing management reports or statements for customers more quickly and more efficiently than they, and will put pressure on their staffs to create new systems and methods which will do likewise. Many companies will also find themselves faced with serious problems because of inadequate planning and the false assumption that delivery of a "machine" will solve the problem. While mechanization is not the only means of meeting this competition, the company which does not consider it carefully will run the risk of falling behind.

This paper has touched upon only the main problems and some of the possibilities in the challenge of mechanization. It is for the administrative assistant, the systems analyst, or the accountant to study the subject and assess its importance in relation to his company's position in a competitive economy. **s/p/a**

An Integrated System for an Insurance Company



Wesley Davenport

▶ Reliance Insurance Company, which writes all types of property and casualty insurance, sells all its insurance through local agents, who are independent businessmen. They represent us on a contract basis and receive a commission for their efforts.

Unlike most life insurance companies, we have our policies typed in the office of the local agent. All policy forms are supplied to the agent by the company. We receive and process about 8,000 orders for approximately 500,000 policies per year.

Old Procedure

Prior to integrating the system, several steps were necessary to process an agent's order for policies:

1. Order received from agent.
2. Order-entry clerk assigned policy numbers and posted the numbers to an agent's master supply record card.
3. Order-entry clerk typed *separately* each of these forms:
   a. Shipping label.
   b. Underwriting Department notice of policy numbers assigned.
   c. Handy reorder post card to be enclosed with each shipment.
   d. Stockroom order ticket telling stock clerk what stock to pull.
4. Shipping label, reorder post card, and stockroom order ticket were sent to stockroom where a clerk pulled stock of policies from supply shelves. (Each agent receives a minimum order of 25 policies consisting of a policy, memorandum copy, and two copies called daily reports.)
5. The local agent's accounting code number was imprinted on the two daily report copies of each policy set by a multigraph machine.
6. A collating clerk inserted three pieces of one-time carbon into each policy set and assembled an order for 25 policies in a folder.

Wesley Davenport, a graduate of the Wharton School of Finance and Commerce, University of Pennsylvania, is Manager of the Systems and Procedures Department of the Reliance Insurance Company, Philadelphia. He is also the current secretary of the Philadelphia Chapter of the Systems & Procedures Association.

CONTENTS
MERCHANDISE
RETURN POSTAGE
GUARANTEED BY:

RELIANCE
INSURANCE COMPANY
401 WALNUT STREET
PHILADELPHIA 6, PA.

POSTAL ZONE NO.____

EXHIBIT 1 Shipping Label

POLICIES

SHIPPED BY

DATE SHIPPED

IMPRINT COST

INSTRUCTIONS

INCLUDE ☐ D.R.'s

POSTAL ZONE NO.____ NO. 21619

ENT. BY_____ DATE ENTERED_____

TYPE	QUANTITY	FROM	TO

OTHER ORDER NUMBER_____

RETURN TO SUPPLY DEP'T. WITH AGENT'S PLATE

FORM SU2F

EXHIBIT 2 Stockroom Order Advice

POSTAL ZONE NO.____

ENT. BY_____ DATE ENTERED_____

TYPE	QUANTITY	FROM	TO

MEMORANDUM OF POLICIES SHIPPED

FORM SU2F

EXHIBIT 3 Underwriting Department Notice

POSTAL ZONE NO.____ USE THIS CARD TO REORDER POLICIES

ENT. BY_____ DATE ENTERED_____

TYPE	QUANTITY	FROM	TO

LAST NO. WRITTEN

AGENT'S SIGNATURE

EXHIBIT 4 Re-order card (Business Reply Post Card)

7. A shipping clerk wrapped the shipment and sent it on to the agent.

New Integrated Procedure

The integrated order processing system has three main features:

A. A snap-out order ticket consisting of 4 parts:

Part 1. Shipping label (see Exhibit 1)

Part 2. Stockroom order advice (see Exhibit 2)

Part 3. Underwriting Department notice (see Exhibit 3)

Part 4. Agent's reorder post card (see Exhibit 4)

B. An Addressograph plate (model GG, 9-line frame) divided into two sections was established for each of our 7,000 local agents. The upper section contains the agent's code number in reverse type, while the bottom section contains the agent's name, address, and code number in conventional type.

C. All policies are printed as snap-out forms. All hand collating of policies, memorandum copies, daily report copies, and one-time carbon paper was discontinued.

Thus, through the integrated system an order is processed in these steps:

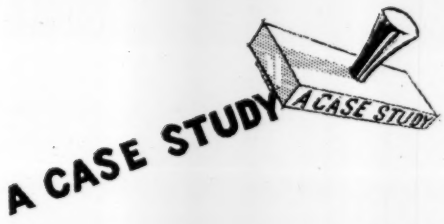
1. Order received from agent.
2. Order-entry clerk pulls agent's Addressograph plate from file and prints the information contained on the bottom section of the Addressograph plate on all parts of the snap-out order ticket simultaneously. This information is printed by a model 100 Addressograph machine which is on the desk of each order-entry clerk.
3. Order-entry clerk assigns policy numbers and posts the numbers to an agent's master supply record card.
4. Parts 1, 2, and 4 of the snap-out order ticket and the Addressograph plate are sent to the stockroom in a glassine carrier folder.
5. Stockroom clerk pulls policy snap-out sets from the supply shelves. Policy sets are boxed for us by the printer, 25 policies to a box, so actually all the stockroom clerk does is to pull a box or several boxes from the shelves depending on how many policies the agent has ordered.
6. Using the top section of the Addressograph plate containing reverse type, the agent's code number is printed on each policy set by running the sets through a model 1900 Addressograph machine.
7. Policies are then sent to the shipping clerk for wrapping and mailing to the agent.

What the Integrated System Has Achieved for Reliance

1. Better service to agents: Policies are now shipped to agents within 24 to 48 hours after receipt of a requisition. Previously, the best service we could render was on a five-day basis.
2. Order-entry clerks have doubled their production through use of the Addressograph machines on their desks.
3. Errors in the agent's code, name, and address throughout the order processing system are impossible through the use of the Addressograph plate.
4. Snap-out policies cost us no more than the hand-collated policies, and we have eliminated all the hand-collating labor cost.
5. The insurance business today is a highly competitive one; new policy forms and coverages are constantly being introduced. Our Supply Department, consequently, is continually faced with mass distributions of policies to many agents at one time. Under the old system, great expense was incurred in coping with peak loads. Under the integrated system, the Supply Department takes peak loads in stride.

s/p/a

A Cost Reduction-Conservation Program



J. S. Hogan

▶ To stimulate cost reduction and conservation, the Surface Armament Division of Sperry Gyroscope Co. introduced a supervisory suggestion club. Supervisors who submit an idea that saves the Division $1,000 or more are issued membership certificates and become eligible for a periodic award for the best idea. Other recognition is given through photographs of the certificate presentation, announcements at supervisory meetings, and news releases. This program has resulted in better communications among supervisors and units. Suggestions are submitted through the procedures supervisor to a committee composed of representation from the top operating positions and management.

This pooling of ideas and freedom from normal departmental reporting channels has had the desired result. Management becomes aware of all ideas and a supervisor receives immediate recognition by having his suggestion considered by "management." Management time is conserved by having all suggestions investigated prior to consideration by the committee. Suggestions and investigation results are reviewed by the committee and each suggestion receives an answer.

Some of the suggestions which resulted in over $100,000 savings for the first year included:

1. The use of "Activated Charcoal" units as filter elements in place of hoods, pipes, and blowers to remove noxious odors from work areas saved $500 in a single application. Plans for a $600 duct installation for a multilith machine were scrapped in favor of the activated charcoal product. Improved efficiency can now be obtained in those work areas where offensive but not dangerous toxic odors exist.

J. S. Hogan is a charter member of the Long Island Chapter of the Systems and Procedures Association and has served as chairman of its Research and Publications Committees. He is also editor of the Chapter's publication, BUSINESS SYSTEMS ENGINEER. *Mr. Hogan has a B.B.A. from Pace College, New York and five years' experience in writing general, accounting, and operating procedures. During his military service, he was an administrative warrant officer. He is presently supervisor of organization and procedures, Surface Armament Division, Sperry Gyroscope Company, Sperry Rand Corporation.*

2. The distribution of various engineering manuals had not been reviewed for some time when a suggestion was received to standardize criteria for their issuance. A formula based on making allowances for physical accessibility and type of engineering effort was proposed. Investigation showed that distribution had become distorted by promotions, transfers, and relocations, and that the number of copies issued could be reduced by over 40 per cent and still maintain an efficient saturation. The resulting cost reduction was:

a. Maintaining manuals and revisions	$5,000
b. Handling and circulating	1,600
c. Space required to store manuals	330
d. Stationery and printing	165
	$7,095

All of our publications were then subjected to the same treatment and an additional cost reduction was gained.

3. A suggestion to shorten the flow of paperwork to obtain material for engineering work in product labs, prototypes, and breadboards had a two-fold result. Under the old procedure our engineer would complete a form and send it to production control for preparation of a requisition. The typed requisitions would then be returned to him for signature or other checking. The requisition was then processed for purchase, again via production control. By designing a new form, we were able to discontinue the use of two previously used forms and to obtain a straight line flow of paper from engineer to production control to purchasing. We also eliminated a typing operation by authorizing hand-written requisitions. The significant cost reductions include:

a. Conservation of engineering time by one-shot issuance of requisitions	$ 3,500
b. Elimination of typing	7,000
c. In-plant transportation of paperwork	500
d. Consolidation of forms including stocking and storing	1,000
	$12,000

In addition, and most important, is the purchase lead time we picked up. The pre-procurement cycle was reduced by at least three days, a gain which is eventually reflected in shorter schedules for delivery of the product.

4. Conservation and cost reduction also result from the *addition* of a service or process. While the usual approach of short cutting, eliminating, combining, or reducing overshadows this concept, there are, nevertheless, many opportunities on this side of the fence. They may be illustrated by a single example.

It was suggested that a manual be issued to list low-cost parts commonly used in experimental and breadboard work. Issuance of the manual resulted in the following savings:

1. Elimination of telephone calls to the store supervisor to check parts:

Time: Requester	$1,600
Stores Supervisor	1,200

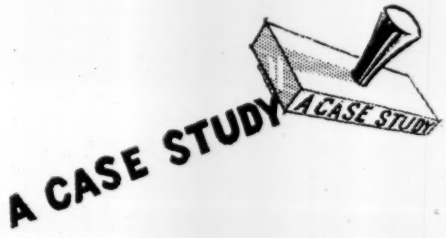
2. Elimination of trips to the stockroom for parts not in stock:

Time: Requester	$3,750
Storekeeper	350
	$6,900

The listing of the stock parts also reduced the need for the purchase of single-item parts and promoted the use of less costly parts which in itself compensated for the cost of preparing the manual.

Experience with our cost reduction conservation program pointed out that constant surveillance and review are required to keep abreast of new techniques, to discontinue practices that have become obsolete, and to correct paperwork records and controls promptly where operations or functions change. **s/p/a**

Progress Toward Centralized Data Processing



William C. Nickell

▶ The reduction of a billing staff from eleven to five and significant improvements in many other areas saved this company $39,764 a year. At the same time, a major step was taken towards mechanization and eventual electronic processing. It took two and a half years to achieve these results but the future potential is now unlimited.

Stage 1

Sales were handled by segregated sales divisions for each product line. Tires and tubes, industrial products, automotive supplies, chemicals, footwear, and fire hose all used different forms and different processing. Individual sales managers were responsible for all operating activities as well as for solicitation. True, the activities followed a similar pattern. A four-part sales order was typed to a four- or six-part sales ticket (factory order), and retyped to a Ditto invoice master, which was duplicated after shipment for invoice copies run on preprinted form sets. (See Chart 1, page 30). A pin-feed, precarboned invoice was developed and after much consideration, persistence, and review of cost comparisons, it was finally adopted.

Although sales orders and sales tickets were still in use in the individual sales areas, Ditto invoice copy running was eliminated in billing at a savings of one and a half heads (one girl was on half days). Window envelopes were also adopted at this time. Studies of present methods were meanwhile being conducted and the practice of handwritten billing explored. Handwritten billing using source documents was not new. In fact many suppliers were using them and company field points—branches, retail outlets, and dealer warehouses—were using about 200,000 a year in 53 locations throughout Canada. In spite of this, the sales managers were adamant. It was, they maintained, absolutely impossible to handle our 70,000 yearly volume at the head office in this way. The miscellaneous billing procedure used for returns, claims, non-trade, and cash sales served, therefore, as the starting point. The volume was relatively small and the transactions not too significant—a good ice-breaker.

William C. Nickell, had extensive experience in systems and procedures with B. F. Goodrich (Canada), Chrysler (Detroit), and Ford (Canada), before becoming a systems consultant. A graduate of the Lake Placid work simplification program and a long-time member of the Systems and Procedures Association, Mr. Nickell is a lecturer, seminar leader, and author of articles on systems and procedures. One previously published by the Systems and Procedures Association is "Clerical Work Measurement," SYSTEMS & PROCEDURES, August, 1958.

OLD METHOD - DITTO INVOICES

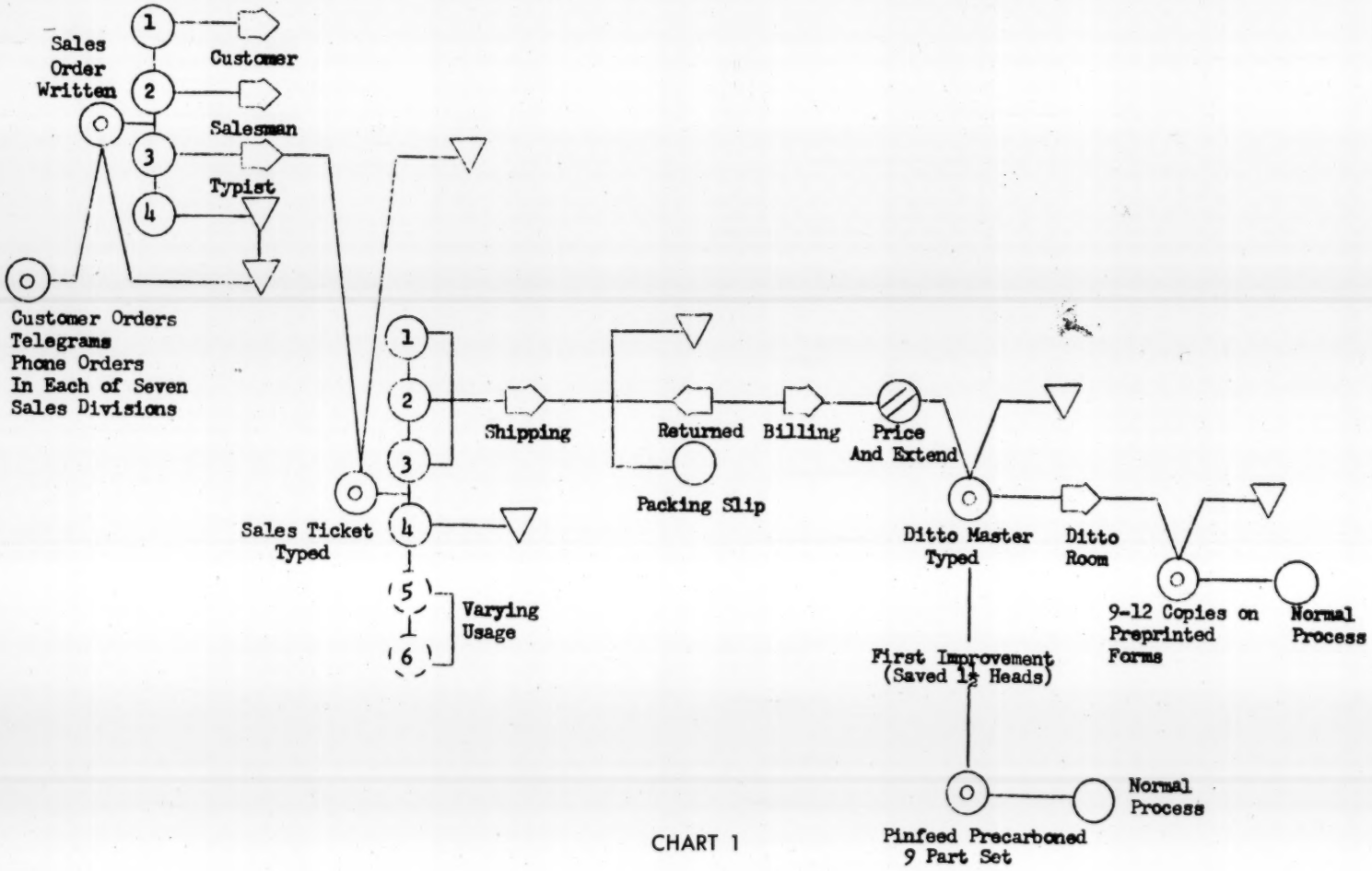


CHART 1

The sales ticket and invoicing requirements for miscellaneous transactions were combined in a precarboned six-part set to be handwritten at the source for shipping, billing, and accounting. Including bills of lading was considered at this time to be too radical. They were included two years later.

The new procedure for processing the miscellaneous bills was finally approved, after strong opposition.

Stage 2

The pattern for study and changeover remained about the same all the way through: Review and chart the present operation with the assistance of those involved; analyse charts, establish volumes, develop proposed methods with cost comparisons and savings anticipated, prepare proposed procedure instructions with form samples, and present them to those involved for approval.

In May and June, 1958, new proposals were presented and accepted in one of the small volume areas. Copy requirements and processing procedure recommendations varied, but the principle of handwritten precarboned forms prepared at the source was accepted. Standardization for mechanization through centralized processing came later. Higher volume areas had to be converted first.

The tires and tubes billing was the highest volume (about 164 daily average) but with few exceptions in processing and an amenable sales manager. Of course his staff had to be satisfied, and rightly so, but after numerous meetings, discussions, and reviews, final approval was secured in July, 1958. By this time, the conversion of credit memo preparation and processing, also previously done by Ditto, had been completed. Because of these conversions, the typing volume in billing had decreased substantially, and with the tires and tube changeover, three additional "leaves" were not replaced. To date, therefore, the total decrease in staff was four and a half.

The industrial products operation was quite complicated. It could build to ship, ship from stock, or purchase to ship. Customers received two invoice copies and copies for salesmen were required.

Two form sets were eventually developed and approved for handling this operation. One set was for orders from the factory, including shipping and billing; the other was to ship and bill from stock or purchase. Bruning reproduction equipment was used to provide extra copies when needed.

The industrial products paperwork procedure conversion actually provided the greatest single savings so far developed. It totalled $19,429 a year.

Application in the footwear department was easy. The sales manager was exceptionally co-operative and interested. The lone problem area now was automotive supplies. They had been approached many times and in different ways, but steadily refused to consider any proposal. However, with success demonstrated in other areas, they finally capitulated March, 1959.

The procedure for processing sales information was now 100 per cent in all seven sales divisions. Information was processed on multi-part, precarboned, shipping-invoicing forms, handwritten at originating sources and priced and extended by hand in the billing department. This department had been reduced from eleven persons to five ("leaves" were not replaced). The only typing was to correct errors and to process exports. Sales order and sales ticket forms were eliminated in the sales divisions and internal processing was simplified considerably. Savings totalled $22,812 a year. (See Chart 2, page 32.)

Stage 3

The next stage—standardization and centralization—was tougher. Standardization necessarily involved both the head office and the field areas, as compatible systems were essential for eventual mechanization and/or electronic processing.

Field areas posed a special problem because it was considered desirable to ship and bill directly from them in order to maintain good customer relations, but it was agreed that subsequent operations could conceivably be centralized at the head office. Head office sales divisions, however, still

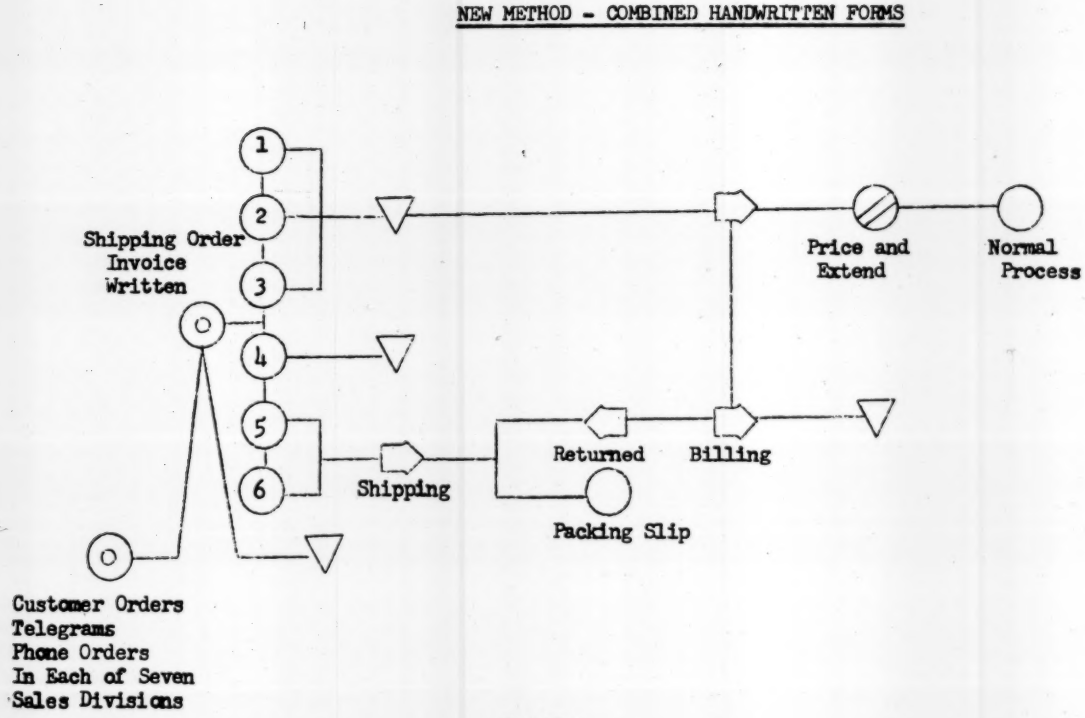


CHART 2

operated as separate units, each with specific requirements although employing the same basic procedure.

Head office centralization required a complete organizational revision. The change involved removing "operations" from the sales divisions and centralizing them into a new sales services department. It became a high-level department, responsible for receiving and processing orders, controlling stock and distribution, planning and scheduling material, and coordinating general information processing services.

Initially this department processed information by product lines but soon converted to a functionalized operation wherein all order processing was handled in one section regardless of product line. The separate empires with segregated data processing activities had fallen. As of October, 1959, the head office and the field points began to use a common shipping-invoicing form processed through a common system. Bills of lading were included at this point with an additional savings of $16,952 a year. The total annual savings was now $39,764.

Stage 4

Compatible information processing systems were now established and the head office operations centralized. The operation is ready for further mechanization and/or electronic processing. Equipment to type, extend, and provide complete shipping-billing documents with punched cards as a by-product for handling accounts receivable, inventory control and distribution, sales analyses and costing is available and can be adopted easily. Field points can provide punched tape or cards to save head office conversion costs. They can be fed into a head office mechanized system. The basis for an integrated communication system has been developed, which can link field areas and the head office. The only question remaining is cost. Is such a conversion justafiable? Only time and further study will answer this question. At least we feel that the studies and efforts during these last two and a half years have been worth while and that we have a good basis from which to proceed. **s/p/a**

The Human Element in a Systems Survey

Philip E. Wheatley

▶ A systems and procedures man is dependent upon people for results. His surveys cannot be conducted at a drawing board or in the seclusion of a laboratory. A great deal of his working time is spent interviewing employees to get information about their duties. He must get their cooperation as well as that of management to have his ideas accepted and implemented. A basic qualification of a successful systems analyst is, therefore, an ability to understand people and what motivates them. In order to do this and remove fears and doubts and enlist the cooperation of others, he must understand basic principles of human behavior. The purpose of this article is to consider a few of these principles which the writer has found from his experience in systems work to be vitally important.

It is impossible to over-emphasize the need for care and insight in interviewing and dealing with those involved in a systems survey. Initial hostility among some employees is inevitable. Many surveys have failed because of this. In the final instance, few companies will force systems changes on a determinedly antagonistic group of employees.

Management can help to overcome these difficulties by its manner of announcing the survey—setting the stage for it. However, the personal attitude and approach of the analyst who does the work is the most important factor.

His difficult cases will frequently fall into several distinquishable types. The following cases of Smith, Jones, and Brown will be familiar to most readers.

Case One. Smith is an inventory control clerk. He is satisfied with his job and has no particular ambitions. However, Smith is a family man and is highly security-conscious. Rumors of economies promised by the "efficiency experts" have made him frightened and suspicious. He does not know exactly what the systems analyst is trying to do but has some vague idea that his own employment is threatened. He resolves to give only the minimum amount of information, and, if possible, to mislead the analyst by stressing the complexity of his work.

Smith is really the product of a badly planned survey. A clear and frank statement by management regarding the objects of the survey and, wherever possible, an assurance that no dismissals or demotions will result should have dispelled his fears before the analyst came to see him.

Unfortunately, analysts do not always work under these ideal conditions. An analyst must, therefore, break down Smith's hostility, get his confidence and cooperation. Flattery and superficial camaraderie are unlikely to help, because Smith is sensitive about what he believes to be an "investigation" and will not react favorably to a backslapping, patronizing approach. Smith should be treated as an intelligent person, capable of understanding the survey and its objects. Before asking any questions, the analyst should explain why they are important and how Smith's job affects the problem as a whole. He should be prepared to spend a little time outlining the problem and encouraging Smith to state his views. This is not merely good applied psychology. Such a procedure may also produce useful information which has so far been overlooked. If Smith can be made to feel that he is participating in the survey, he is more likely to provide accurate information regarding his work.

* * *

Case Two. Jones is the young supervisor of a small section in the general office. He is intelligent and ambitious. He has conceived a number of potential

Philip E. Wheatley is a systems and procedures analyst with Woods, Gordon & Co., management consultants, Toronto, Canada. A graduate (in economics) from the University of London, England, he served in the Intelligence Corps of the British Army, 1950-52. He is a member of the Toronto Chapter, Systems & Procedures Association.

method improvements but has had difficulty in persuading management to consider them seriously. He therefore feels frustrated and is not particularly pleased with the news that management has authorized a methods specialist to conduct a survey in his department. Jones is, in fact, angry that someone else is being given the opportunity to produce improvements which are obvious to him. He makes up his mind not to go out of his way to help the analyst.

This case has been handled badly by management. Jones should have been given credit for his initiative. When management first decided to undertake a formal survey, Jones should have been called in and asked to outline his ideas to the systems analyst. This would have assured him that his views were not being ignored. Furthermore, if his conclusions are valid, much of the analyst's time can be saved. The groundwork he carried out and the data he collected would, if nothing else, provide a useful starting point for the analyst's survey.

If Jones is not handled carefully by management, he becomes a stumbling block for the methods analyst. While probably not openly obstructing the survey, he is likely to conceal useful data and may even discourage his clerical staff from cooperating with the analyst.

The analyst must be completely frank in his approach to Jones. He should assure him that his only interest is to arrive at useful recommendations for the firm. He should promise to give Jones full credit in his report to management for any usable suggestions Jones provides. He should indicate that the survey may in fact be an excellent vehicle for getting Jones' ideas recognized and implemented. Once Jones' reluctance has been overcome, however, he can produce difficulties of another kind; his cooperation may become over-enthusiastic. Prospects of reaching the ear of management may stimulate his creative energy to such an extent that the analyst finds himself besieged. Preventing this other extreme will test the analyst's tact and skill.

* * *

Case Three. Brown is the manager of a large office department and has been with the company 35 years. He does his work conscientiously and, on the whole, satisfactorily. He has agreed grudgingly to a survey of certain areas of his department, but, from the outset, has expressed strong doubts as to whether or not improvements can be made. Brown feels able to operate the present systems but is nervous about what changes might involve. He is aware, for example, that he is not familiar with modern data processing methods and doubts his own ability to learn about them. Brown has always busied himself with "activity" detail, and cannot visualize supervising technical operations which he does not fully understand. He fears that systems changes may result, therefore, in his losing his job to a younger man. Part of his method of defense is to raise every possible objection to ideas which the analyst puts forward.

Brown is a difficult case to handle and represents an apparently insurmountable obstacle for the analyst. The cooperation of Smith and Jones was sought mainly because their help was needed in providing data for the survey. Brown's cooperation, on the other hand, is needed because the results of the survey and the final recommendations must be "sold" to him before they can be implemented. If he has made up his mind not to accept recommendations of any kind, it may be impossible for the analyst to get results.

Brown's voluntary cooperation can be won only through extreme tact and patience. At all costs the analyst must avoid appearing to be a "smart aleck." While avoiding transparent flattery, he should emphasize in conversation Brown's greater experience with and closer knowledge of the problems being studied. Again, frankness is the best general policy. The analyst should consult Brown as often as possible and discuss with him all the data collected and all the ideas being considered. At this stage, persuading Brown to debate the ideas, if only in a destructive manner, is half the battle. The analyst should make a point of agreeing wherever practicable with some of Brown's objections, continually returning with revised ideas for Brown's consideration. He should

describe any office equipment under consideration in the simpliest possible terms.

Brown may ultimately be won over. If he can be made to feel that the recommendations are being developed largely by him, his confidence may be built up in his ability to supervise their implementation and his self-respect may be preserved.

The most disastrous mistake on the part of the analyst working with Brown would be to conduct the survey independently and to consult Brown only when the proposals have been developed. This procedure would intensify his hostility. He would feel that his only possible course of action was to fight the proposals. Discussion with him would be obstructed continually by fear and misunderstanding and would probably manifest itself by an unreasoning dislike of the plans which he had not participated in formulating.

Some Principles

From the hypothetical cases, it is not difficult to pick out several basic principles which a systems analyst should follow as he works with the operating staff during a survey. They are summed up here as three rules:

1. *Be frank.* Make sure everyone concerned knows the purpose of the survey. Don't be afraid to express your thoughts and discuss them before the proposals are finalized. Take the staff into your confidence during the survey. This will remove suspicion and speculation. It will help to enlist cooperation and get information from them which may save you many days of work.
2. *Be tactful.* The interviewee may resent or suspect you. Don't talk down to him. Encourage him to converse. Try to win his goodwill; consider his opinions carefully.
3. *Avoid being dogmatic.* Recognize the possibility that you may be wrong. Be prepared to make concessions whenever practicable.

Anyone concerned with carrying out a systems survey will find that his task is easier if he follows these three principles.

s/p/a

Administration: Its Purpose and Performance *by Ordway Tead; Harper & Bros., New York, 79 pages, 1959, $2.50*

This book is a distillation of the current thinking of Dr. Tead, who has been described as a major influence on management philosophy in our generation. The text is a collection of his three lectures given under the sponsorship of the Ford Foundation in 1959. In them, Dr. Tead examines the field of administration in light of current conditions to see what has changed, what we have learned, and what new emphasis is developing today.

The first lecture is entitled "Administration Among the Great Ideas" and propounds that there can be no philosophy of administration apart from a considered philosophy of life. Science, democracy, power, authority, leadership, selfhood, equality, freedom, and love are briefly but powerfully discussed as to how they impinge on, and permeate, the world of administration.

The second lecture is titled "Administration as an Instrumental Idea" and discusses the essential areas around the question: "How do we run the show so that administrative purposes are realized." Administration affects the daily lives of all of us. Dr. Tead points out that administration promises to improve organization health so as to minister to the creativity and self-actualization of the individuals comprising the group.

In the third lecture, "Administration as Personal Performance," psychological health, personal philosophy, the question of administration as a profession, and training are discussed. In discussing administration as a moral act and the administrator as a moral agent, the author gets into the concept of love as the probable key answer to that refinement of administrative practice that is capable of yielding the ultimate beneficial results for all members of all organizations.

This book is recommended to anyone interested in a study of the concepts of management and administration. *(Reviewed by William D'Arbanville, Walson & Company.)*

Dynamic Management Decision Games *by Jay R. Greene and Roger L. Sisson; John Wiley and Sons, Inc., New York, 1959, $2.50.*

The purpose of this book is to introduce the reader to a form of simulation—the game—as a powerful educational tool for training people in effective decision-making. It considers such games to be the business counterpart, with a great potential, of the successful "war games" of the military. A distinction is made between *the game* and the better known *case-study* technique.

While the value of business games is heavily stressed, the authors clearly point out some important limitations in their use. The book discusses the rapid progress made in recent years in the development of business games, but observes that all of these have depended on the use of electronic computers or have been aimed at simulating only top-management level problems.

The unique contribution of this book is the presentation for the first time of seven non-computer games which cover all management levels and a multitude of problems. The seven games cover material inventory, personnel, retailing, production scheduling, industrial sales, top management, and market negotiation problems and make up the major part of the book. The games start out simple in structure to assist the reader in grasping the essential elements of gaming and gradually become more complex. Each game has specific background information for the instructor and complete instructions and information for the players and the referee. The book also includes detailed steps for the construction of a game and procedures by which the instructor can direct and modify a game to meet a specific need.

The book is recommended as a short and simple introduction to the use in business of gaming techniques for management training. *(Reviewed by N. L. Senensieb, Hughes Aircraft Co., and member, San Fernando Valley Chapter, SPA.*

Automation and Society *edited by Howard Boone Jacobson and Joseph S. Roucek; Philosophical Library, New York, 553 pp., 1959, $10.*

On the threshold of any "new world," one's sense of proportion easily goes awry when the eyes are set on the glittering future so that little or no thought is given to where the feet might presently stumble and falter. So, too, with the promise of automation until, in answer to the need, a book such as *Automation and Society* comes along. In it the combined resources of government, industry, and education provide a solid, well-balanced approach to what is often termed—in anticipation, awe, and sometimes fear—the "second industrial revolution." Essays of nearly three dozen thoughtful observers offer, in this book, a penetrating analysis of many facets of automation; its short past, long future, and effects on society.

Directly or indirectly, everyone has a personal stake in automation; no major segment of society or human activity will long remain untouched by it. In our headlong rush toward a new industrial order, it is imperative, therefore, to have a level-headed philosophy that facilitates adjustments to the new technology and makes the transition as painless as possible. This volume gives a realistic and comprehensive point of view, since both the potential good and the potential evil of automation are carefully and knowledgeably examined.

For the reader who is more directly and actively engaged in this field, the book also offers extensive bibliographical material at the end of each chapter, an excellent 53-page dictionary of automation terminology, and 37 case histories of applications in U. S. and Canadian companies. *(Reviewed by Frank E. Mayer, Northrop Corporation, and member, San Fernando Valley Chapter, SPA.*

Managing by Communications, *by Willard V. Merrihue; McGraw-Hill Book Co., New York, 306 pages, 1960, $7.*

Business communication, according to the author, ". . . is a broad conception equalling, in its magnitude and importance to the business, such other accepted or upcoming practices as automation, decentralization, or operations research and synthesis."

The stated purpose of the book is ". . . to help businessmen see above and beyond the innumerable techniques of employee and public communication, to help them perceive the essential purpose of the process . . ."

The author takes a broad look at communication: The process itself and its role in business; the manager's part in communication, using it to improve employee, union, and community relations and the business climate; the supervisor's function in providing two-way communication between manager and employee; the principles, techniques, and media employed; and finally, specific management uses of this tool. Mr. Merrihue accomplishes his purpose of a general view of the subject. The book is well written, informal, and readable.

There are many salient points in this book for consideration by systems people in devising effective ways to convey accurately their intentions and philosophies to both management and employees. As with many of the writings on this subject, however, one is a bit unsure at times whether we are not ultimately in business to communicate rather than communicating to stay in business. Also, there are overtones of rampant paternalism evident in many of the examples of ventures into employees' personal lives.

In sum, *Management by Communication* is worth reading for the practical approaches one may glean from it, and for the insight to the attitude of yet another group as to the relative position and merit of their speciality. *(Reviewed by E. Daniel Butler, Management Services Division, Ernst & Ernst and member, Cleveland Chapter, SPA.)*

Operations Research—*Methods and Procedures, by Maurice Sasieni, Arthur Yaspan, and Lawrence Friedman; John Wiley & Sons, Inc., 440 Fourth Avenue, New York, 316 pp., 1959, $9.50.*

This book is intended to fill the important need for a practical textbook on the mathematical techniques of operations research. As such, it contains illustrative problems and exercises based upon material which has been used in courses at Case Institute of Technology. While the book is written for a person with a knowledge of calculus, it contains much useful information even for one with only a background in high-school algebra.

Each chapter of the book deals with one of the analytical techniques that has been found useful by operations research specialists. Some of the theories discussed are probability, sampling, theory of games, and dynamic programming. Also covered are the various techniques used to solve problems in inventory control, equipment replacement, waiting lines, and the optimum allocation of limited resources. Each chapter generally contains a not-too-technical discussion of the general theory and techniques in the areas covered, together with meaningful illustrations of applications. Also included are examples of completely solved problems as well as a number of problems for the reader to solve, some with answers.

The increasing application of mathematical techniques in the general and administrative area of a business makes it imperative that all systems and procedures analysts become familiar with operations research methods and procedures. For one who can diligently apply himself in learning a new subject, this book is an invaluable aid. It is one of the first books especially designed as an operations research text, and the authors have done a creditable job in keeping the exposition of the operations research techniques relatively simple and practical. There are even sections which are of interest to an office manager; practical material is presented in such problem areas as the sampling of accounting records (aging of accounts receivable), replacement of items that fail (light bulbs), assignment (allocation of tasks), and waiting lines (staffing a servicing activity to handle a varying level of operations).

Although this book is a valuable text for the person who is interested in learning something about operations research, it is not a panacea to the basic problem of mastering the difficult-to-learn mathematical and analytical tools of operations research applications. While the job of learning the operations research methods and procedures can be difficult, the authors of this book have done a lot toward making the job manageable and within the reach of most of us. *(Reviewed by Clifford Craft, Peat, Marwick, Mitchell & Co.)*

Records Retention—*A Practical Guide, by William E. Mitchell; Ellsworth Publishing Company, 314 Newcastle Road, Syracuse 4, New York, 48 pp., 1959, $5.00.*

Within the past two years several publications have been made available to systems people on the subject of records retention. These have presented excellent guides for the review of records retention practices. For the most part, however, they have been listings of statutes and retention clauses with little about "interpretation." In his book, Mr. Michell takes this latter need into account and analyzes the intent of certain statutes.

He makes some interesting and effective observations. The strong point in his approach is that, knowing the volume and complexity of legal requirements, he concentrates on those which are of immediate interest. The result provides the analyst with a pattern of investigation based upon company requirements.

While Mr. Mitchell's coverage of retention requirements is authoritative and well documented, that of other phases of record-keeping activities is not strong. In areas such as retention schedule development, the housing of inactive records, vital records protection, and the use of microfilm, Mr. Mitchell injects personal opinions. These opinions may be well founded but space did not allow him to justify them. The more experienced records management reader, therefore, will find this to be a weak point in an otherwise well presented book. His bibliography is of little value since it is limited to three or four general items. Considering the need in the records field for well-expressed viewpoints and sources of information, Mr. Mitchell would have made an exceptional impact on the records field had he given more consideration to these points.

In the introduction to his book, Mr. Mitchell states "the main objective of this publication is to acquaint the reader with practical measures that can be taken to dispose of old business records." He has met this objective, particularly through his schedules on state tax records, ICC regulations, statutes of limitation, and a recommended retention schedule. As with other authors on the subject, Mr. Mitchell does not attempt to answer all questions. He does provide a "new" approach, however, and one worthy of attention. His book is recommended as a good source of information and suggestions on retention scheduling. It may serve a challenge to experienced records managers, for Mr. Mitchell's viewpoints differ from those stated in other recent literature. *(Reviewed by William Benedon, Corporate Records Management Advisor, Lockheed Aircraft Corporation, Burbank, California, and member, San Fernando Valley Chapter, SPA.)*

Punched Cards, Their Application to Science and Industry *(Second Edition), edited by R. S. Casey, J. W. Perry, A. Kent, and Madeline Berry; Reinhold Publishing Corp., New York, 697 pages, 1958, $15.*

The general nature of the title suggests a broad treatment of punched cards. However, the content is confined to the field of "recall and correlation of recorded information" in technical research and subject matter analysis. The first part is a primer on a wide variety of punched cards — tabulating, notched, slotted, optical coincidence — including several un-punched card systems such as "Uniterm" and "Filmsort." Descriptions of the equipment and devices used to manipulate the various types of cards are included.

Part 2 is devoted to a number of information retrieval system applications using both punched and un-punched cards. Some of these applications are presented in a how-to-do-it style.

Part 3 covers coding and systems design. Compared to the first two sections which are essentially practical, Part 3 is theoretical.

Part 4 discusses future possibilities in information retrieval. One chapter is devoted to a general discussion of the basics of electronic computers. An extensive bibliography, author index, and subject index end the book.

To those who have information retrieval problems or have fair-sized technical libraries or subject files, the book can be a valuable acquisition. The average systems analyst, whose major concern is business data proccessing rather than information retrieval, will not be greatly interested in it. To be sure, ideas come from many sources and

systems developed for information retrieval might be adapted to a data processing problem by an imaginative and ingenious analyst. *(Reviewed by John King, Jr., Bolta Products Company, and member, Bay State Chapter, SPA.)* **s/p/a**

Worth Reading

S. Joseph Schneider

"Pay Off Computer Costs with Two Hours Work," *Modern Office Procedures,* February, 1960.

Describes how an incentive payroll system is handled on a computer at the Steel Division of Ford Motor Company (Dearborn, Michigan) by preparing weekly standards for new orders. Actual job cards are later compared electronically to the standard and the bonus figure computed.

"Use Sales Forecasts to Trim Inventory 20 Per cent," *Modern Office Procedures,* February, 1960.

General, illustrated description of a production control system in a company with 250 products made from 15,000 parts. Visible index cards and punched card equipment is used.

"Eliminate Pennies—Save Dollars," Paul J. Horschler, *NAA Bulletin,* January, 1960.

Suggests the elimination of pennies from preliminary records and books of account by rounding figures to the nearest whole dollar, and clearing the penny variance with a "penny account." Identifies these sources of increased productivity:

1. Less errors
2. Less time needed to locate and correct errors
3. Less pressure at critical times, faster closings, quicker statements.

Claims the following as likely effects on personnel:

1. Improves morale in accounting areas.
2. Reduces menial aspects of jobs, giving them more "importance."
3. Helps to unlock suggestions by personnel.

"Vendor Code Numbers," William E. Mitchell, *NAA Bulletin,* January, 1960.

Suggests the establishment of a central national assignment of numbers for companies. These would appear on all documents sent between companies and thus eliminate the need for each company to code all the other companies with which it does business.

"A Pilgrim's Progress toward EDP," Donald A. Reed, *NAA Bulletin,* January, 1960.

A philosophical examination of significant considerations in working with computers. Touches on feasibility studies, learning to live with a computer, and generating enthusiam in operating management levels.

"Reports Which Managements Find Most Useful," *NAA Bulletin* (Section 3), February, 1960.

Explains and illustrates several examples of each of these reports: Interim income statement, product activity, labor efficiency, manufacturing expense, and project cost.

"Office Machines and Furniture Study," C. E. Ginder, *Office Executive,* January, 1960.

Discusses results of survey of 1,500 companies on these aspects of office machines and furniture: Rent, standardization, replacement, depreciation, and service agreements. **s/p/a**

Publishers:

1. *Modern Office Procedures,* Irving B. Hexter, 812 Huron Road, Cleveland, Ohio.
2. *NAA Bulletin,* National Association of Accountants, 505 Park Avenue, New York 22.
3. *Office Executive,* Journal of the National Office Management Association, Willow Grove. Pa.

Methods Groups—Success Or Failure

▶ Why do some methods groups operate so successfully while others meet with conspicuous failure? There are many reasons which lead to one or the other result. Let me touch on some of the more important ones.

From the outset, the objectives, authority, responsibility, and methods of operation of the group must be clearly defined. Unless that is done the group has no organizational status; no one in the organization understands how it is to function. It is axiomatic that no important undertaking in a company is likely to succeed unless it has the support of management. Methods groups must not only have strong management support from the outset, but their accomplishments must ensure that such support will be sustained. Many groups begin operations under favorable auspices, but in time, management seems to lose interest. Why? Because *the group so often dissipates its efforts on work falling into the category of "trouble-shooting" rather than concentrating on meeting management's objectives.*

In order to hold management's interest and continued support, a methods group must be *management oriented.* Its operations should be guided by a well-considered, long-range improvement program, developed in close collaboration with management and supervisory personnel at various management levels. Where this is done, management objectives are seldom, if ever, lost sight of. The methods group becomes a *recognized agent of management* in effecting the needed improvements for all concerned.

Another reason for the ineffective functioning of a methods group is its close identification with a single department of the company. Such identification makes it difficult for the group to sell its ideas to personnel in other departments. The latter feel that, in making their recommendations, the methods men are influenced in favor of accomplishing primarily the objectives of the department they represent.

A methods group must be free to cross departmental lines. It must have the confidence and full cooperation of employees in all departments. A group of methods men whose organizational status does not ensure their acceptance as reasonably independent and objective advisors, working in the interests of the company as a whole, is likely to encounter considerable difficulty in coordinating up-to-date techniques and efficient procedures to overall management objectives. This independence is particularly important today, when new and complex data processing methods, more sophisticated management techniques, and improved operational and administrative procedures vital to modern management depend for their maximum effectiveness upon careful integration of activities in many units of a company.

Methods work has been characterized as a process of selecting the best from a number of alternative courses of action. A successful methods man thinks, therefore, in terms of basic functions rather than in terms of conventional and traditional practices. He follows a systematic program of self-improvement. He recognizes his obligation always to search for better ways of doing things and to contribute, to the best of his ability, to widening the range of technical knowledge of his fellow methods men. He seeks outside professional advice when he needs to compare his conclusions with those from an independent source or when the importance of the task before him seems to exceed his abilities and resources. In this way he is most likely to find solutions which blend experience with independent, imaginative analysis and forward thinking. In this way, too, he is most likely to grow in stature in his organization and to attain the professional status that his function deserves. *(by J. Pelej, partner, Price Waterhouse & Co.)* **s/p/a**

The INTERNATIONAL SYSTEMS MEETING 1960

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